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BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

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REPORT OF ANNUAL PINE BEETLE SURVEYS

ON THE

DESCHUTES NATIONAL FOREST, OREGON

1939 AND 1940

By

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Bureau of Entomology and Plant Quarantine
Forest Insect Investigations

October 1940

Forest Insect Laboratory
445 U. S. Court House
Portland, Oregon

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REPORT OF ANNUAL PINE BEETLE SURVEYS

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DESCHUTES NATIONAL FOREST, OREGON

1939 and 1940

Conducted through Cooperation
of
Forest Service
and
Bureau of Entomology and Plant Quarantine

Approved by:

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Portland, Oregon
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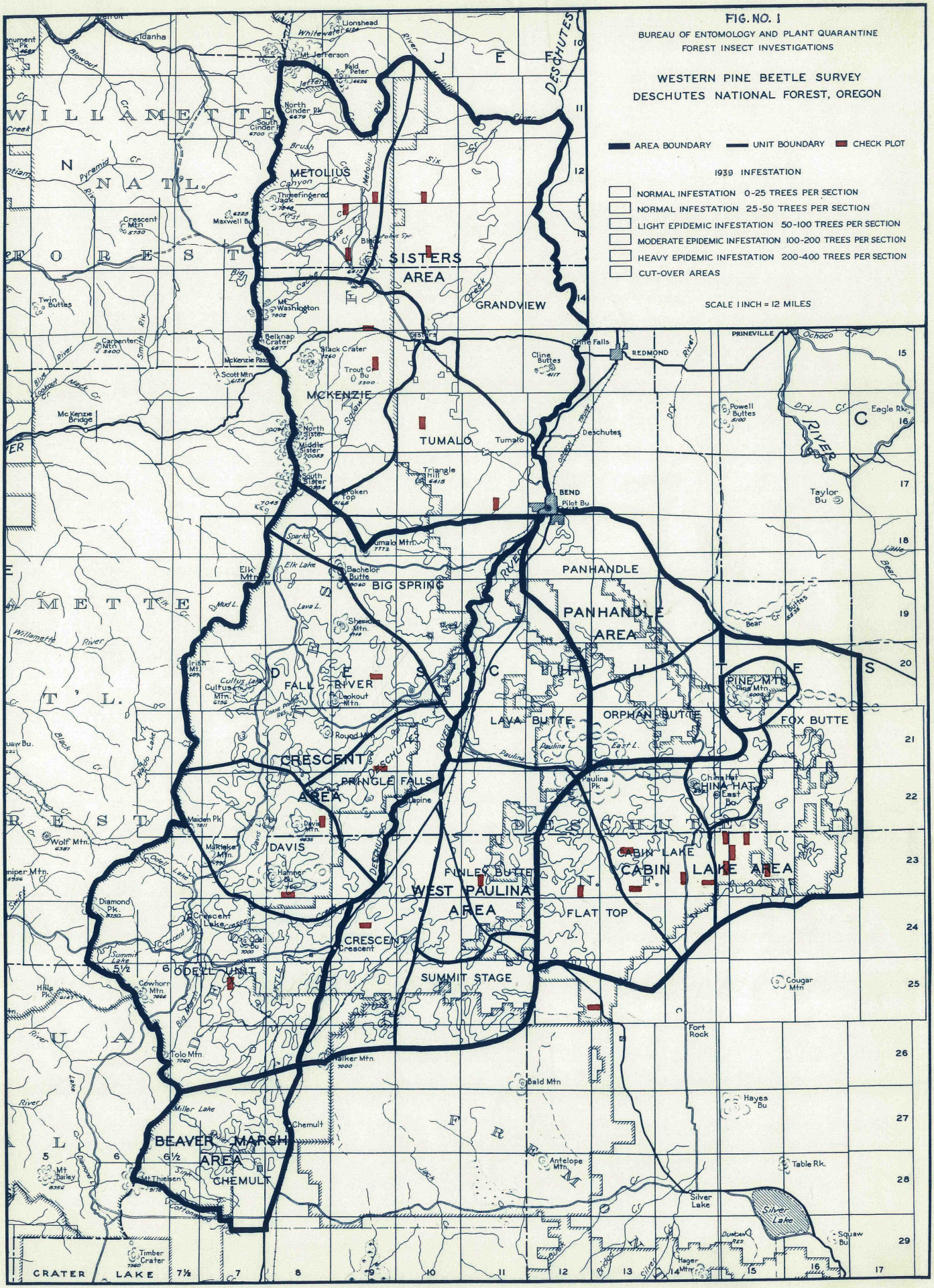
FIG. NO. 1
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS
WESTERN PINE BEETLE SURVEY
DESCHUTES NATIONAL FOREST, OREGON
AREA BOUNDARY
UNIT BOUNDARY
CHECK PLOT
1939 INFESTATION
NORMAL INFESTATION 0-25 TREES PER SECTION
NORMAL INFESTATION 25-50 TREES PER SECTION
LIGHT EPIDEMIC INFESTATION 50-100 TREES PER SECTION
MODERATE EPIDEMIC INFESTATION 100-200 TREES PER SECTION
HEAVY EPIDEMIC INFESTATION 200-400 TREES PER SECTION
CUT-OVER AREAS
SCALE 1 INCH = 12 MILES
SISTERS AREA
GRANDVIEW
METOLIUS
MCKENZIE
TUMALO
PANHANDLE
PANHANDLE AREA
BIG SPRING
FALL RIVER
LAVA BUTTE
ORPHAN BUTTE
FOX BUTTE
PINE MTN.
CRESCENT
PRINGLE FALLS AREA
DAVIS
CABIN LAKE
CABIN LAKE AREA
FINLEY BUTTE
WEST PAULINA AREA
FLAT TOP
CRESCENT
SUMMIT STAGE
ODELL UNIT
BEAVER MARSH AREA
CHEMULT
BEND
REDMOND
PRINEVILLE
DESCHUTES
CRATER LAKE

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INTRODUCTION

Purpose

In February 1939 a report was prepared by the author concerning the results of the pine beetle surveys conducted on the Deschutes National Forest during the period 1931 to 1938, inclusive. That report gave in detail certain historical and other basic data which are not included in this report. The reader is, therefore, referred to the 1939 report for the detailed background information which is lacking in the 1940 report.

The United States Forest Service and the Bureau of Entomology and Plant Quarantine have carried out annual pine beetle surveys on the Deschutes National Forest since 1931. The objects of these annual surveys are, namely: (1) To determine the locale, trends, and severity of pine beetle activity, for which the western pine beetle is mostly responsible (Dendroctonus brevicomis Lec.); (2) to delineate those areas in need of control work and to determine the effectiveness of control work on areas previously treated; (3) to gather such data as stand structure of the green timber and tree classification of beetle-killed trees as an aid in furthering general knowledge of ponderosa pine management problems.

Personnel

To complete the 1939 survey the United States Forest Service employed three Junior Field Assistants, consisting of Messrs. J. P. Rhody, P. A. Layman, and R. C. Grant. These men completed the Deschutes assignment between July 17 and August 17, 1939, under the direct field supervision of A. J. Jaenicke of the Regional Office at Portland. The 1940 survey crew of F. A. Kimmey, J. A. Beckim, and G. W. Summerside was employed jointly by the Bureau of Entomology and Plant Quarantine and Forest Service. This crew, under the supervision of Mr. Jaenicke, completed the Deschutes assignment between August 10 and September 5, 1940.

The 1939 survey consisted of extensive and intensive methods. The intensive survey was made on 27 permanent half-section check plots which are systematically distributed throughout the Forest. The cruise work on these plots consisted of a 100 per cent tally of the insect-killed trees and those which died from other causes. In the 1939 survey

a 10 per cent volume cruise and a 10 per cent stand structure cruise by Keen's tree classes were completed for all the plots for which these data had not been secured in previous surveys. The check plots represent samples covering about one per cent of the ponderosa pine volume of the Forest and are used as a basis for determining insect losses on the Forest as a whole. Table No. 1 gives a detailed description of each check plot on the Forest.

In addition to the loss cruises on the 320-acre plots, an ocular extensive beetle survey was made. The varying loss intensities on the sample plots served as a yardstick for making the extensive loss estimates. These general observations were made by the crew leader who estimated the varying intensity of insect depredation by traversing different roads to and from the check plots. These field observations furnished the ground work for subsequently making section estimates in the office and for the preparation of an infestation map showing beetle losses on the one million acres of ponderosa pine lands included within or adjacent to the Deschutes National Forest.

The 1940 survey varied from the 1939 survey in that an increment core was taken from each tree killed by insects in 1940. These cores should furnish data useful in determining the growth rates of recently killed trees and how these growth rates vary from those of normal trees.

INSECT LOSSES

Bark-beetle check plot losses for the past several years show the beetle infestation rising from .69 per cent of the stand killed in 1933, to a peak loss of 1.37 per cent in 1935, and subsiding to .46 per cent of the stand killed in 1937. Since 1937 the losses increased to .69 per cent of the stand killed in 1938, .77 per cent of the stand killed in 1939, and to an estimated 1.05 per cent in 1940. Table No. 2 lists the plot losses and trends for the last three years. The 1940 survey was conducted during a period when only approximately 44 per cent of the total 1940 loss could be marked. Therefore, the estimated 31 per cent increase for 1940 over 1939 may receive some revision when the complete 1940 losses have been recorded in 1941. The loss prediction is based on a comparison of volume losses and does not consistently check with that obtained by comparing tree losses. Table No. 3 gives the number of trees killed on the check plots and shows the 1940 increase to be only 10 per cent greater, which is a prediction 21 per cent lower than the one obtained by using volume as the basis. Both predictions are subject to revision, and the predicted volume increase for 1940 should approximate an average of the volume and tree ratios.

Estimated insect losses by sections for the entire Forest show .61 per cent of the stand killed in 1938 and .72 per cent of the stand killed in 1939. The predicted loss for 1940 is 114,850 trees and 72,400,000 board feet of pine timber. These estimated and predicted losses occurred on an acreage roughly estimated at 1,161,000 acres of public and private ponderosa pine land with a volume of about ten billion feet. This acreage has been divided into six infestation areas, which in turn have been subdivided into units. The estimated insect losses by these areas and units for 1938 and 1939 are compiled in Tables No. 4 and 5. Final loss data for 1940 are not available and have, therefore, been omitted in the loss estimates for the areas and units. However, in Table No. 2 loss predictions are given for each of the sample plots.

The question may arise as to the disparity between the predicted 1940 check plot increase of 20 per cent and the predicted gross loss for 1940 which is slightly less than the 1939 gross loss. This lack of conformity to one ratio of increase is explained by the following, namely: (1) The unequal distribution of check plots throughout the forest, which has been caused largely by the loss, through cutting, of the plots on the Cabin Lake Area. This has resulted in a preponderance of plots now located in the Sisters Area where the infestation is increasing; (2) artificially produced reductions in gross insect loss such as caused by the Sisters Control Project and the light selection cutting on the Cabin Lake Area, are not regarded in the check plot prediction but are given consideration in gross loss predictions.

During the spring of 1939 an outbreak of the Great Basin tent caterpillar (Malacosoma fragilis Stretch) occurred on many areas of the Deschutes National Forest. J. M. Whiteside of the Portland Insect Laboratory visited the areas in May 1939 and found the caterpillar defoliating the bitterbrush (Purshia tridentata) in epidemic proportions. A return visit to the Cabin Lake Area on August 5, 1939, showed remarkable recovery by the plants. The area was again visited in June 1940, and the infestation showed a marked endemic state. These epidemics are periodic, the present one starting in 1937; and the current quiescent state is probably a direct result of severe adverse weather conditions during the early part of June 1940 and the presence of numerous predators and parasites.

CONTROL WORK CONDUCTED

A control project on the Sisters Area was recommended by this laboratory and carried out by the United States Forest Service during the late winter of 1939 and the early part of 1940. An increase in bark-beetle activity, the availability of a CCC camp in the center of the area to be treated, and the high value of the infested stand were all factors favoring the project. Spotting work started on October 9, 1939, and by December 29, 3,344 trees were marked for treating on 65,000 acres. Treating began on November 13, 1939, and the work was successfully completed by March 8, 1940. Key men from the short term protection force of the Forest furnished the personnel for the spotting crews. The treating was done by CCC labor from Camp Sisters under the supervision of foremen experienced or trained for control work.

This control project is singular in the fact that there are nine 320-acre check plots located on and adjacent to the treated area. These plots furnish an accurate basis for a study of the accuracy and effectiveness of spotting and control work. Control work was carried out on four of the plots. On the remaining five plots no treating was done, and these served as a basis for comparison with the treated plots. The untreated plots showed a 1940 infestation increase of 56 per cent over 1939, while a 6 per cent reduction was found on the treated plots. Although the reduction of 6 per cent does not approach the effectiveness resulting from previous control projects, it does approximate the results expected on this area.

The plots on the treated area were useful in showing what proportion of the infested trees were missed by the spotters. Ordinarily, during the late fall, spotting crews should detect and mark for treatment about 90 per cent of the total number of trees infested by the western pine beetle. On the check plots, out of 94 total infested trees 78 had been marked for treatment. This amounts to 83 per cent of the total number of trees requiring treatment on four sample plots including 1,280 acres.

Table No. 6 shows the comparison of the 1940 infestation between the treated and untreated plots on and adjacent to the control area.

CONCLUSIONS

Bark beetles are becoming increasingly active, and the trend since 1937 is definitely upward. The 1938 and 1939 check plot losses show increases respectively of 48 and 11 per cent over the previous year. Check plot losses for 1940 are predicted to be 20 per cent greater by volume than they were in 1939, but this figure is liable to correction since it is based on cruises made too early in 1940 to obtain a complete tally of the total year's loss.

The estimated damage by bark-beetles on the Deschutes National Forest amounts to .61 per cent of the stand, or 64 million board feet, for 1938, and .72 per cent of the stand, or 73 million board feet, for 1939. The predicted gross loss for 1940 is 72 million board feet.

A winter control project was successfully carried out on the Sisters Area in late 1939 and early 1940, where 3,344 trees were treated on 65,000 acres. The effectiveness of the project was shown by a slight reduction on the treated plots and an increase in beetle activity on the untreated plots.

A serious outbreak of the Great Basin tent caterpillar in bitter brush occurred on many areas of the Forest but was naturally controlled in 1940 by adverse weather conditions, predators, and parasites.

RECOMMENDATIONS

In view of the increase in beetle activity for 1940, it is advised that the 1941 survey be carried out. The heavy increase in beetle infestation on the check plots in the Sisters Area, together with the slight reduction found on the treated plots, is strong evidence that a general cleaning up of the area is essential during the winter of 1940. This has been recommended and control work is already under way.

Table No. 1

Description of Check Plots on the Deschutes National Forest

Area and Unit	Plot Name	Location T.	S.	R. E	Sec.	Elevation	Type*	Site	Timbered Acres	Susceptible Volume Percent**	Pine Volume January, 1938	Board Feet per Acre
Sisters Area												
Metolius	Jack Creek	13	9	5E	N½ cut	3000	20.5	III-	320	50.7	6,052,170	18,910
	Allingham	12	9	35W	¼ cut	3300	20.5	III-	320	50.2	4,941,960	15,440
	Black Butte	13	9	29E	¼ cut	3200	20.5	III-	320	37.9	9,334,038	29,150
McKenzie	Cold Springs	14	9	34S		3440	20.5	IV	320	37.3	4,939,840	15,430
	Brush Draw	15	9	14W	cut	3500	20.5	III-	320	92.7	6,872,645	21,460
Grandview	Prairie Farm	12	10	33E		4100	20.5	IV	320	49.3	4,925,695	15,390
	Squaw Ridge	13	10	27E		3900	20.5	IV-	320	38.3	2,553,790	7,970
Tumalo	Melvin Butte	16	10	16W	cut	3900	20.5	IV-	320	50.0	3,413,235	10,650
	Tumalo	17	11	28E	cut	4000	20.5	IV	320	43.0	2,761,282	8,630
Crescent Area												
Pringle Falls	Pringle Falls	21	9	35S		4400	20.5	III-	320	23.1	5,171,370	16,160
Davis	Davis Mt.	22	8	25W		5150	20.5	III	320	44.1	7,352,760	23,020
	Black Rock	23	8	32S		5100	20.5	III	320	42.5	6,394,550	19,980
Fall River	Lava Rock	20	9	23S		5200	20.5	IV+	320	48.2	8,526,030	26,630
Odell	Odellview	25	7	22E	cut	4750	20.5	IV+	320	59.0	5,560,145	17,360
West Paulina Area												
Crescent	Crescent	24	9	15S	? probable cut	4400	20.5	IV	320	44.1	5,414,460	16,900
Finley Butte	Moffitt Butte	23	11	29W	cut	4350	20.5	IV+	240	30.4	3,106,100	9,710
Silver Lake Area												
Pot Holes	Gebhardt Well	25	12	25N	cut	4700	20.5	IV-	320	40.0	2,239,002	6,990

(Continued on next page)

Table No. 1 (continued)

Area and Unit	Plot Name	Location T.S	R.E	Sec.	Elevation	Type*	Site	Timbered: Acres	Susceptible Volume Percent**	Pine Volume January, 1938	Board Feet per Acre
Cabin Lake Area											
Cabin Lake	Cabin Lake	23	14	29E	4600	20.5	IV	320	50.6	2,700,885	8,440
	Tom Butte	23	13	10S	5300	20.5	IV	320	32.1	4,698,680	14,670
	Steigleder	23	14	27S	4700	20.5	IV	320	18.9	3,126,270	9,770
Sixteen Butte	Poly Top	23	14	1N	5200	20.5	IV	320	14.4	1,680,900	5,250
	Horseshoe	23	14	24E	4500	20.5	IV-	300	31.1	1,695,110	5,660
	Wigtop	23	15	22E	5200	20.5	IV-	320	24.4	2,808,510	8,780
	Deadlog Butte	23	15	18W	4350	20.5	IV-	310	53.8	2,725,380	8,800
	Sixteen Butte	23	15	8W	4900	20.5	IV	240	33.1	3,299,073	13,740
Flat Top	Flat Top	24	13	20E	4200	20.5	IV+	320	57.2	3,269,585	10,220

*Correspond to Forest Resource Survey type.

**Includes Keen classes 3C, 3D, 4B, 4C and 4D.

Table No. 2

Check Plot Losses and Trends, Deschutes National Forest

Area and Plot	1938 Losses: Volume Bd. Ft.	1938 Losses: Bd. Ft. per Acre	1938 Losses: Percent of Stand	1938 Losses: Volume Ratio 1938 to 1937	1939 Losses: Volume Bd. Ft.	1939 Losses: Bd. Ft. per Acre	1939 Losses: Percent of Stand	1939 Losses: Volume Ratio 1939 to 1938	1940 (Prediction): Volume Bd. Ft.	1940 (Prediction): Bd. Ft. per Acre	1940 (Prediction): Percent of Stand	1940 (Prediction): Volume Ratio 1940 to 1939
SISTERS AREA												
Jack Creek	37,980	118	.63	1.43	29,510	92	.49	.78	70,000	219	1.17	2.37
Allingham	31,500	98	.64	2.58	31,370	98	.64	1.00	36,700	115	.75	1.17
Black Butte	35,745	112	.38	2.79	15,560	49	.17	.44	35,300	110	.38	2.27
Cold Springs	29,170	91	.59	1.40	56,480	176	1.15	1.93	79,000	247	1.62	1.40
Brush Draw	30,660	96	.45	1.12	27,450	86	.40	.90	31,900	100	.47	1.16
Prairie Farm	46,540	145	.94	2.68	45,390	142	.93	.98	95,500	298	1.97	2.11
Squaw Ridge	44,240	138	1.73	1.31	49,110	153	1.95	1.11	74,900	234	3.04	1.52
Melvin Butte	30,780	96	.90	.73	37,340	117	1.10	1.21	127,200	398	3.80	3.41
Tumalo	58,920	184	2.13	..88	77,420	242	2.86	1.31	72,000	225	2.74	.93
Total	345,535	99	.75	1.36	369,630	128	.83	1.07	622,500	216	1.38	1.68
CRESCENT AREA												
Pringle Falls	10,845	34	.21	.87	15,290	48	.30	1.41	42,900	134	.83	2.81
Davis Mt.	10,610	33	.14	1.00	16,690	52	.23	1.58	6,920	22	.09	.42
Lava Rock	24,640	77	.29	2.42	26,760	83	.31	1.08	44,400	139	.52	1.66
Black Rock	27,800	87	.44	3.38	39,690	124	.62	1.43	22,300	70	.35	.56
Odellview	7,175	22	.13	1.08	16,260	51	.29	2.26	23,740	74	.43	1.46
Total	81,070	51	.24	1.60	114,690	72	.35	1.41	140,260	88	.42	1.22

Table No. 2 (continued)

Check Plot Losses and Trends, Deschutes National Forest

Area and Plot	1938 Losses: Volume Bd. Ft.	1938 Losses: Bd. Ft. per Acre	1938 Losses: Percent of Stand	1938 Losses: Volume Ratio 1938 to 1937	1939 Losses: Volume Bd. Ft.	1939 Losses: Bd. Ft. per Acre	1939 Losses: Percent of Stand	1939 Losses: Volume Ratio 1939 to 1938	1940 (Prediction): Volume Bd. Ft.	1940 (Prediction): Bd. Ft. per Acre	1940 (Prediction): Percent of Stand	1940 (Prediction): Volume Ratio 1940 to 1939
WEST PAULINA AREA												
Crescent	22,160	69	.41	2.93	31,740	99	.59	1.43	14,760	46	.28	.47
Moffit Butte	34,970	109	1.12	5.90	35,060	110	1.14	1.00	45,600	142	1.50	1.30
Total	57,130	89	.67	4.19	66,800	104	.79	1.17	60,360	94	.72	.90
SILVER LAKE AREA												
Gebhardt Well	51,985	162	2.32	1.24	72,520	226	3.30	1.40	72,500	226	3.41	1.00
CABIN LAKE AREA												
Crater Butte	32,300	101	.98	1.46								
Cabin Lake	11,330	35	.42	.69	10,140	32	.38	.90				
Flat Top	21,640	68	.66	1.78	10,620	33	.33	.49				
Tom Butte	18,050	56	.38	1.36	7,250	23	.15	.40				
Steigleder	12,265	38	.39	2.60	41,770	131	1.34	3.41				
Dead Log Butte	45,275	141	1.66	1.93	42,180	136	1.57	.93	44,100	142	1.67	1.04
Wigtop	28,920	90	1.03	1.37	32,420	101	1.17	1.12	29,140	91	1.06	.90
Poly Top	45,195	141	2.69	.99	49,571	155	3.03	1.10	49,400	154	3.12	1.00
Horseshoe	24,605	77	1.45	1.47	22,420	70	1.34	.91	23,680	74	1.44	1.06
Sixteen Butte	42,605	133	1.29	3.40	32,620	136	1.00	.76	22,750	71	.71	.70
Total	282,185	88	.96	1.50	248,991	89	.97	1.00	159,070	105	1.34	.89
DESCHUTES NF	817,905	96	.69	1.43	872,631	106	.77	1.11	1,054,690	152	1.05	1.31

Table No. 3

Number of Trees Killed on Check Plots
Deschutes National Forest

Plots	1938	1939	1940 (Predicted)	Ratio 1940:1939
Jack Creek	36	51	105	2.1:1
Allingham	40	40	41	1.0:1
Black Butte	63	28	38	1.4:1
Cold Springs	47	106	90	0.8:1
Brush Draw	45	39	38	1.0:1
Prairie Farm	55	62	73	1.2:1
Squaw Ridge	114	133	188	1.4:1
Melvin Butte	60	55	175	3.2:1
Tumalo	84	106	80	0.8:1
Pringle Falls	20	25	33	1.3:1
Davis Mountain	14	18	11	0.6:1
Lava Rock	25	34	50	1.2:1
Black Rock	27	41	21	0.6:1
Odellview	19	24	20	0.8:1
Crescent	31	39	23	0.6:1
Moffit Butte	20	26	36	1.4:1
Gebhardt Well	77	117	100	0.9:1
Crater Butte	47	Cut in 1939		
Cabin Lake	9	9	Cut in 1940	
Flat Top	19	19	Cut in 1940	
Tom Butte	6	6	Cut in 1940	
Steigleder	16	40	Cut in 1940	
Dead Log Butte	56	58	58	1.0:1
Wigtop	42	39	31	0.8:1
Poly Top	77	82	95	1.2:1
Horseshoe	39	35	32	0.9:1
Sixteen Butte	45	37	21	0.7:1
Total	1133	1269	1359	
Ratio to Previous Year*	1.4:1	1.2:1	1.1:1	

*Ratios are based only on those plots for which the data are complete for the two years compared.

Table No. 4

Estimated Gross Losses for 1938 on Infestation AREAS and Units

Deschutes National Forest

Unit	Ponderosa Pine Acreage	Volume of Ponderosa Pine 1938 M.b.m.	Estimated 1938 Losses: Trees	Volume M.b.m.	Trees per Section	Board Feet per Acre	Percent of Stand
SISTERS AREA							
Metolius	70,000	793,000	5,200	4,000	48	57	.50
Grandview	119,000	1,172,000	21,000	12,000	113	101	1.02
McKenzie	80,000	1,198,000	9,000	6,000	72	75	.50
Tumalo	71,000	631,000	12,000	7,000	108	99	1.11
Total	340,000	3,794,000	47,200	29,000	89	85	.76
PANHANDLE AREA (cutover)							
Panhandle	68,000	28,000	2,200	500	21	7	1.78
Orphan Butte	38,000	141,000	1,900	800	32	21	.57
Total	106,000	169,000	4,100	1,300	25	12	.77
CRESCENT AREA							
Davis	55,000	904,000	3,190	3,500	37	64	.39
Pringle Falls	31,000	358,000	2,030	1,300	42	42	.37
Fall River	62,000	835,000	3,640	3,000	38	48	.36
Big Spring	54,000	100,000	2,530	700	30	13	.70
Odell	48,000	536,000	1,930	1,500	26	31	.28
Total	250,000	2,733,000	13,320	10,000	34	40	.37
WEST PAULINA AREA							
Lava Butte	61,000	68,000	2,050	500	22	8	.74
Finley Butte	66,000	495,000	3,460	2,500	34	38	.50
Crescent	44,000	563,000	3,280	2,200	48	50	.39
Summit Stage	39,000	508,000	2,140	1,500	35	38	.30
Total	210,000	1,635,000	10,930	6,700	33	32	.41

Table No. 4 (continued)

Estimated Gross Losses for 1938 on Infestation areas and units, Deschutes National Forest

Unit	Ponderosa Pine Acreage	Volume of Ponderosa Pine 1938 M.b.m.	Estimated 1938 Losses: Trees	Volume M.b.m.	Trees per Section	Board Feet per Acre	Percent of Stand
CABIN LAKE AREA							
Cabin Lake	59,000	579,000	3,640	3,300	40	56	.57
Sixteen Butte	25,000	186,000	3,460	2,300	89	92	1.24
Fox Butte	46,000	59,000	2,500	600	35	13	1.02
China Hat	8,000	94,000	1,300	900	95	112	.96
Pine Mountain	6,000	63,000	1,560	1,200	166	200	1.91
Flat Top	63,000	670,000	6,290	4,700	64	75	.70
Total	207,000	1,651,000	18,750	13,000	58	63	.79
SILVER LAKE AREA							
Pot Holes	22,000	239,000	4,000	2,600	116	118	1.09
BEAVER MARSH AREA							
Chemult	26,000	196,000	1,700	1,400	42	54	.71
GRAND TOTAL	1,161,000	10,417,000	100,000	64,000	55	55	.61

Table No. 5

Estimated Gross Losses for 1939 on Infestation AREAS and Units

Deschutes National Forest

Area and Unit	Ponderosa Pine Acreage	Volume of Ponderosa Pine January 1939 M.b.m.	Estimated 1939 Losses: Trees	Volume M.b.m.	Average Number Trees per Section	Board Feet Per Acre	Percent of Stand
SISTERS AREA							
Metolius	70,000	789,000	6,000	4,200	55	60	.53
Grandview	119,000	1,160,000	25,100	13,769	135	116	1.19
McKenzie	80,000	1,192,000	12,100	7,260	102	91	.61
Tumalo	71,000	624,000	12,700	8,145	114	115	1.30
Total	340,000	3,765,000	55,900	33,374	105	98	.89
PANHANDLE AREA (Cut-over)							
Panhandle	68,000	28,000	3,000	720	28	11	2.57
Orphan Butte	38,000	140,000	1,800	810	30	21	.58
Total	106,000	168,000	4,800	1,530	29	14	.91
CRESCENT AREA							
Davis	55,000	900,000	4,900	4,410	57	80	.49
Pringle Falls	31,000	357,000	2,600	1,586	54	51	.44
Fall River	62,000	832,000	5,400	4,482	56	72	.54
Big Spring	54,000	99,000	2,600	570	31	11	.58
Odell	48,000	534,000	3,000	2,310	40	48	.43
Total	250,000	2,722,000	18,500	13,358	47	53	.49
WEST PAULINA AREA							
Lava Butte	61,000	68,000	2,200	555	23	9	.82
Finley Butte	66,000	493,000	4,900	4,220	47	64	.85
Crescent	44,000	562,000	3,700	2,627	54	60	.47
Summit Stage	39,000	506,000	3,200	2,144	52	55	.42
Total	210,000	1,629,000	14,000	9,546	43	45	.59

Table No. 5 (continued)

Estimated Gross Losses for 1939 on Infestation Areas and Units, Deschutes National Forest

Area and Unit	Ponderosa Pine Acreage	Volume of Ponderosa Pine January 1939 M.b.m.	Estimated 1939 Losses: Trees	Volume M.b.m.	Average Number Trees per Section	Board Feet Per Acre	Percent of Stand
CABIN LAKE AREA							
Cabin Lake	59,000	494,000	3,200	3,165	30	54	.64
Sixteen Butte	25,000	184,000	3,100	2,081	79	83	1.13
Fox Butte	46,000	46,000	2,000	500	28	11	1.09
China Hat	8,000	93,000	1,200	800	96	100	.86
Pine Mountain	6,000	62,000	1,100	825	117	137	1.33
Flat Top	63,000	657,000	5,800	4,234	59	67	.64
Total	207,000	1,536,000	16,400	11,605	51	56	.76
SILVER LAKE AREA							
Pot Holes	22,000	236,000	5,200	3,328	151	151	1.41
BEAVER MARSH AREA							
Chemult	26,000	156,000	1,000	605	25	23	.39
GRAND TOTAL	1,161,000	10,212,000	115,800	73,346	64	63	.72

Table No. 6

Western Pine Beetle Losses on the Treated and Untreated Plots on the Sisters Area

Plot	Number of Trees Killed	
	1939 Loss	Predicted 1940 Loss
Treated Plots		
Black Butte	27	25
Allingham	31	38
Brush Draw	38	29
Cold Springs	94	86
Untreated Plots		
Prairie Farm	50	51
Jack Creek	37	92
Squaw Ridge	77	91
Melvin Butte	44	150
Tumalo	84	71
Totals		
Treated Plots	190	178
Untreated Plots	292	455

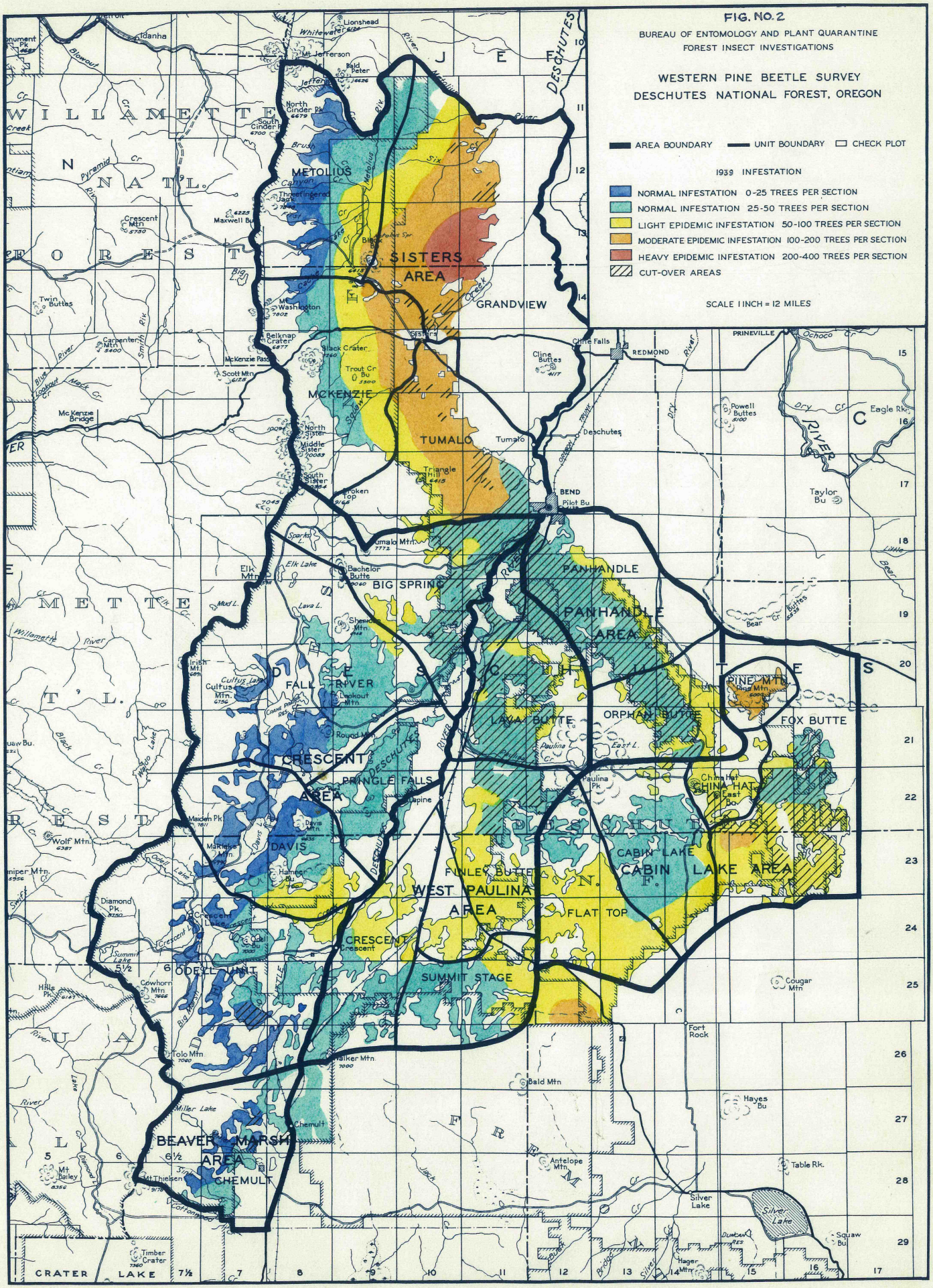
FIG. NO. 2
BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE
FOREST INSECT INVESTIGATIONS
WESTERN PINE BEETLE SURVEY
DESCHUTES NATIONAL FOREST, OREGON
AREA BOUNDARY
UNIT BOUNDARY
CHECK PLOT
1939 INFESTATION
NORMAL INFESTATION 0-25 TREES PER SECTION
NORMAL INFESTATION 25-50 TREES PER SECTION
LIGHT EPIDEMIC INFESTATION 50-100 TREES PER SECTION
MODERATE EPIDEMIC INFESTATION 100-200 TREES PER SECTION
HEAVY EPIDEMIC INFESTATION 200-400 TREES PER SECTION
CUT-OVER AREAS
SCALE 1 INCH = 12 MILES
METOLIUS
SISTERS AREA
GRANDVIEW
MCKENZIE
TUMALO
BIG SPRING
PANHANDLE
PANHANDLE AREA
FALL RIVER
CRESCENT
CRESCENT AREA
PRINGLE FALLS
DAVIS
LAVA BUTTE
ORPHAN BUTTE
FOX BUTTE
PINE MTN.
CHINA HAT
CABIN LAKE
CABIN LAKE AREA
FINLEY BUTTE
WEST PAULINA AREA
FLAT TOP
SUMMIT STAGE
ODELL UNIT
BEAVER MARSH AREA
CHEMULT
REDMOND
BEND
PRINEVILLE
SILVER LAKE
FORT ROCK
CRATER LAKE